

# High-Efficiency, Nanowire Based Thermoelectric Tapes for Waste Heat Recovery, Phase I

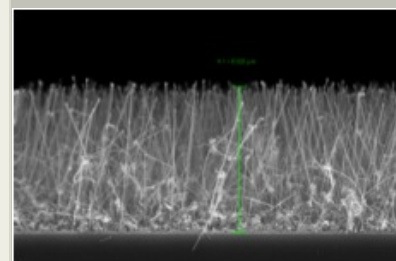
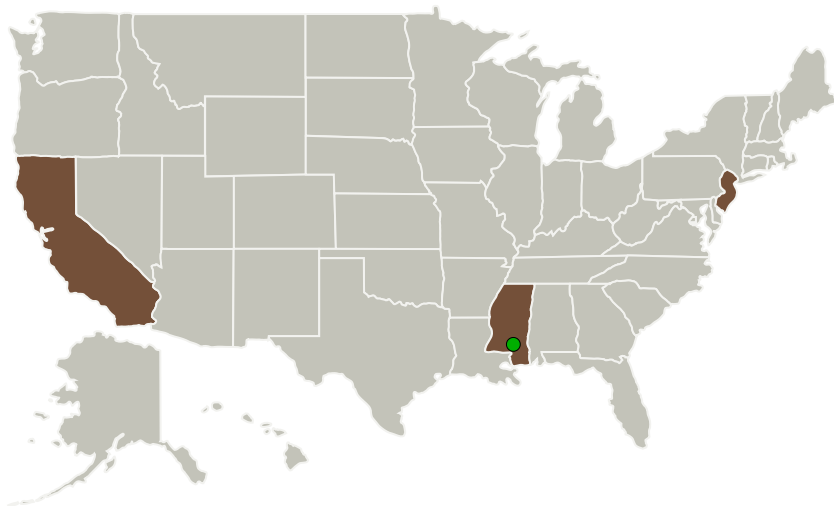
Completed Technology Project (2013 - 2014)



## Project Introduction

Thermoelectric devices offer a simple and reliable means to convert radioisotope thermal energy into useable electrical power. Present thermoelectric devices based on bulk materials are limited by low conversion efficiencies, due to fundamental limitation of identifying materials with both a high electrical conductivity and low thermal conductivity. Nanowires provides a means to circumvent this limitation, and achieve combinations of properties not possible with bulk materials. To accomplish this task, SMI will demonstrate the formation of nanocomposite structures in a SiGe matrix by gas flow hollow cathode (GFHC) sputtering creating high ZT for the GFHC sputter deposited solid state nanocomposite thermoelectric materials. The potential for high deposition rate, and thick films for the solid state nanocomposite materials, on a range of substrates, by GFHC sputtering will be investigated and demonstrated, along with a pathway forward to development of a high efficiency TE power conversion system prototype in Phase II.

## Primary U.S. Work Locations and Key Partners



High-Efficiency, Nanowire Based Thermoelectric Tapes for Waste Heat Recovery

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Structured Materials Industries, Inc.	Lead Organization	Industry	Piscataway, New Jersey
● Stennis Space Center(SSC)	Supporting Organization	NASA Center	Stennis Space Center, Mississippi
University of California Santa Cruz Office of Sponsored Projects(UCSC-OSP)	Supporting Organization	Academia	Santa Cruz, California

## Primary U.S. Work Locations

California	Mississippi
New Jersey	

## Project Transitions

▶ **May 2013:** Project Start

✓ **May 2014:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138407>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Structured Materials Industries, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

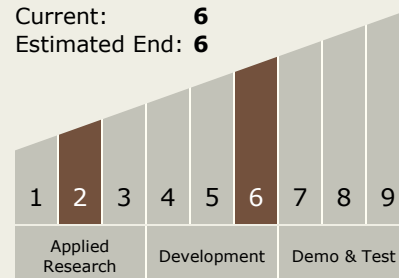
Carlos Torrez

### Principal Investigator:

Nick Sbrockey

## Technology Maturity (TRL)

Start: 2  
Current: 6  
Estimated End: 6

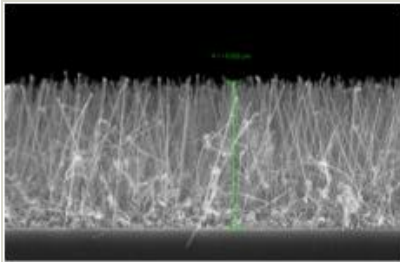


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## Images



### Project Image

High-Efficiency, Nanowire Based Thermoelectric Tapes for Waste Heat Recovery

(<https://techport.nasa.gov/image/127187>)

## Technology Areas

### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.1 Power Generation and Energy Conversion
    - └ TX03.1.4 Dynamic Energy Conversion

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System